

University of Groningen

Contributions to the genetics of *Tenebrio molitor* L.

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CHAPTER V. LINKAGE	340
CHAPTER VI. VARIOUS OBSERVATIONS	345
§ 1. <i>Ultra-violet light</i>	345
§ 2. <i>Length</i>	347
§ 3. <i>Experiments on the possibility of mating one ♀ successively with more ♂♂.</i>	348
SUMMARY	350
LITERATURE	352

INTRODUCTION

In 1915 ARENDSSEN HEIN started experiments with *Tenebrio molitor* on a large scale. A large number of varieties were examined by him for their heredity, and he also determined what conditions and what food are most favourable for the culture of these animals. The comprehensive results were published in a series of papers during the years 1920–1924 (2, 3, 4, 5, 6).

After ARENDSSEN HEIN's death the investigation was continued in Groningen by FERWERDA (29). I will summarize the results of their work here as far as they are necessary for the discussion of my own work.

ARENDSSEN HEIN already ascertained that the three colour types: orange, yellow brown and umber brown, indicated according to the colour of the larvae, differ from each other in one gene. The sequence of dominance is orange → umber brown → yellow brown.

As FERWERDA communicates, a reversal of dominance occurs in the cross umber brown with orange. The larva looks more like the orange, the beetle like the umber brown type. FERWERDA fully discusses the origin of pigments and this has induced me to investigate what the difference between orange and umber brown consists in. (Chapter I).

The type with V-shaped head groove found by ARENDSSEN HEIN and examined genetically by FERWERDA is dominant over normal and is controlled by one gene (B), which lies in the same chromosome as the factor *g* for flesh-coloured eyes. According to FERWERDA the factors B and *g* have a lethal effect, when present in a homozygous

condition. This linkage and this lethality have been further examined by me (Chapter V).

The eye colour had already been partly analysed by ARENDSSEN HEIN (3). FERWERDA found the following genetic formulae for the four varieties black, red, yellow and flesh-coloured:

♀	♂	
FFGGHH	FFGGHo	black
ffGGHH	ffGGHo	red
FFGGhh	FFGGho	yellow
ffGGhh	ffGGho	
FFggHH	FFggHo	flesh-coloured
ffggHH	ffggHo	
FFgghh	FFggho	

FERWERDA evidently did not know the triple recessive variety. I have tried to ascertain the eye colour of this genotype (Chapter II).

Besides these 4 types there is a fifth which FERWERDA called "gefleckt". The eye of these animals is partly black, partly red. In chapter III the results of a number of crosses are discussed, which I have made with a view to the analysis of this character.

One of my crosses gave rise to an animal with eyes which were partly black, partly flesh-coloured. This case has been analysed in chapter IV.

The great difference in length among individuals in the same culture induced me to trace whether these are due to genetic differences (Chapter VI).

Larvae, pupae and beetles were exposed to ultra-violet rays, in order to discover whether this treatment caused any mutations (Chapter VI).

As the technique has undergone but slight alterations, a short description may suffice.

The females deposit their eggs on bits of flannel specially provided for this purpose. These eggs are counted twice a week and then removed with the bit of flannel to little ointment pots standing in an incubator at 26° C. After about 10 days the young larvae emerge. These are counted once a week, and are then transferred to a big ointment pot with food, also kept in the incubator. After 5 to 7 months they pupate and they are then transferred twice a week to flat earthen plates. After about 10 days the beetle emerges, it is

examined and transferred to a flat dish similar to the one in which the pupae are. If necessary males and females are separated. These dishes of pupae and beetles are placed on top of each other on shelves along the wall of the room.

For crossing purposes a male and a female or a number of males and females are put in a glass crystallization dish, which is then put in an incubator having a temperature of about 26° C. For food they get a piece of dry rusk, a slice of raw potato for moisture, and a little bit of paste consisting of equal parts of white of egg and rusk. All this is renewed twice a week. The larvae get the same food as mentioned by ARENDSSEN HEIN (2); the beetles in the beetle-dishes get dry rusk. Both get a slice of potato for moisture, the larvae twice a week and the beetles once. In the pupae-dishes a slice of potato is also given once a week in order to prevent the young beetles from feeding on the pupae.

The research was made in the Genetic Institute of the State University at Groningen under the guidance of Prof. Dr. T. TAMMES.